MULTIMEDIA UNIVERSITY

STUDENT ID NO										

Table No.	

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2022/2023 (TERM ID 2230)

PDS0101 – INTRODUCTION TO DIGITAL SYSTEMS

(All sections / Groups)

5 OCTOBER 2023
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

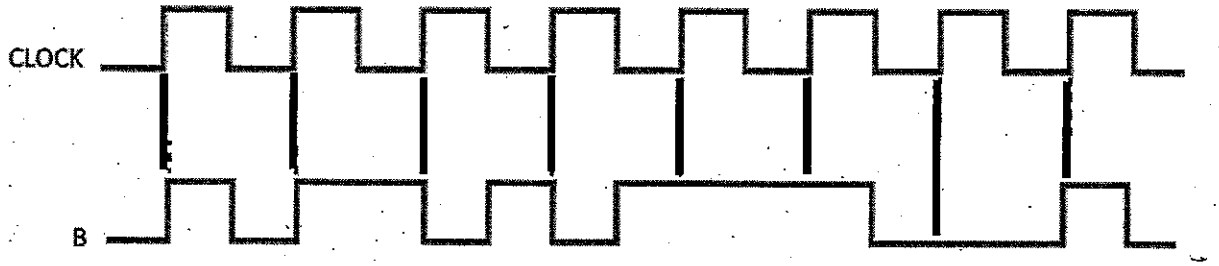
1. This question paper consists of 9 pages including a cover page with 5 questions. Attempt **ALL** questions.

2. The total mark for this paper is 50 marks.

3. Write all your answers in this question paper.

QUESTION 1

a) Referring to the waveform below, answer the following questions.



i. Determine if the waveform B is periodic or non-periodic. Explain it.
ii. Indicate the sequence of bits for waveform B when the clock is at the positive-going edge.
iii. If the frequency of the clock is 20Hz, identify the total time needed to serially transfer data B.
iv. If the frequency of the clock is 20Hz, identify the total time needed to transfer data B in parallel.

[2+1+2+1 Marks]

Continued...

b) Convert the Hexadecimal number A7 into the following number systems. Show all steps.
   i. Binary
   ii. Octal

[2+2 Marks]

QUESTION 2

a) Perform the following arithmetic. Show all steps.
   i. $364_8 - 27_8$
   ii. $364_8 + 27_8$
   iii. $10101_2 - 111_2$
   iv. $A8_{16} + 2E_{16}$
   v. $A8_{16} - 2E_{16}$

[5 Marks]

Continued...

b) Perform the calculation of $12_{10} - 34_{10}$ using 8-bits signed 2's complement binary numbers and provide your answer in decimal.

[5 Marks]

Continued...

QUESTION 3

a) Design a combinational logic circuit with 3 inputs (A, B, C), and 1 output (X) in detecting minority zero. It produces output HIGH when input combination contains minority zero.

i. Draw the truth table for the above problem indicating all possible combinations for the output.

ii. Obtain the SOP expression based on the truth table in (i).

iii. Simplify the expression in (ii) using Boolean Algebra.

iv. Construct a simplified logic diagram based on the expression in (iii).

[2+1.5+1+2 marks]

Continued...

b) Given Y = AB + B'C + AC, do the following:

i. Obtain the standard expression in sum-of-product (SOP).

ii. Simplify the function Y using K-map.

[2+1.5 Marks]

QUESTION 4

a) Design a 2-bit Asynchronous Up Counter using positive-edge clock JK Flip Flop.

[4 Marks]

Continued...

b) State one difference between latch and flip flop

[2 Marks]

c) Draw the logic circuit for the function Y = (A + B) (B' +C)

[4 Marks]

QUESTION 5

a) Design a synchronous counter using positive edge JK Flip Flop that has the sequence as below.

10, 00, 01 and repeat. For the undesired state, its next state goes to DON'T CARES.

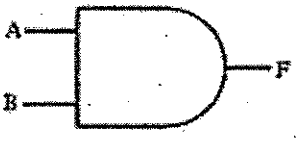
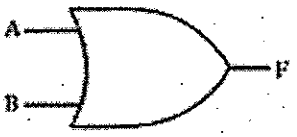
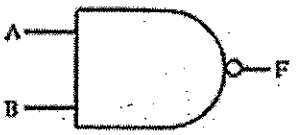
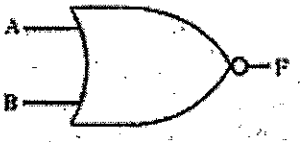
i. Draw the state transition diagram.
ii. Complete the circuit excitation table.
iii. Obtain the Boolean expression using K-map.
iv. Draw the synchronous counter with the simplified expression in (iii).

[1+2+4+3 Marks]

Continued...

Continued...

Appendix

Name	Graphic Symbol	Algebraic Function	Truth Table
AND		F = A · B or F = AB	A B | F 0 0 | 0 0 1 | 0 1 0 | 0 1 1 | 1
OR		F = A + B	A B | F 0 0 | 0 0 1 | 1 1 0 | 1 1 1 | 1
NOT		$F = \overline{A}$ or F = A′	A | F 0 | 1 1 | 0
NAND		$F = \overline{(AB)}$	A B | F 0 0 | 1 0 1 | 1 1 0 | 1 1 1 | 0
NOR		$F = \overline{(A + B)}$	A B | F 0 0 | 1 0 1 | 0 1 0 | 0 1 1 | 0

Q Output		Inputs	
Present State	Next State	J_n	K_n
0	0	0	X
0	1	1	X
1	0	X	1
1	1	X	0

End of Page